

Appl. No. : 09/939,417
Filed : August 24, 2001

REMARKS

Claims 1-22 are pending in this application. Claims 23-24 have been previously cancelled without prejudice. In the Office Action, the Examiner rejected Claims 1-22 under 35 U.S.C. § 103(a). In particular, the Examiner rejected Claims 1-15 and 18-22 as obvious over U.S. Patent No. 5,936,274 to Forbes et al. ("the Forbes patent") in view of U.S. Publication No. 2002/0142546 to Kouznetsov et al. ("the Kouznetsov application"). The Examiner also rejected Claims 16-17 as obvious over the Forbes patent in view of the Kouznetsov application and U.S. Patent No. 5,510,730 to Gamal et al. ("the Gamal patent").

By this amendment, Applicant has amended the title, the specification, Claim 1 and Claim 20. Reconsideration of the application, as amended, is respectfully requested.

I. TITLE OF INVENTION

The Examiner requires a new title that is clearly indicative of the invention to which the claims are directed because the original title of invention is not descriptive. By the foregoing amendment to the specification, Applicant has replaced the original title of invention with a new title of invention.

II. RESPONSE TO DRAWING OBJECTIONS

The Examiner objected to the drawings because they include reference signs not mentioned in the description. Applicant has amended the specification to add the reference signs in the description in conformance with the Examiner's request. Applicant respectfully submits that no new matter is being introduced by way of this amendment and requests that the foregoing amendment to the specification be entered and made of record. Accordingly, Applicant respectfully requests the Examiner to withdraw her objection to the drawings.

III. REJECTION OF CLAIMS 1-15 AND 18-22 UNDER 35 U.S.C. § 103(a)

The Examiner rejected Claims 1-15 and 18-22 as obvious over the Forbes patent in view the Kouznetsov application. In view of the above claim amendment and the following discussion, Applicant respectfully traverses this rejection.

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To properly cite a combination under U.S.C. § 103(a), the Examiner must establish a prima facie case of obviousness as required by M.P.E.P. § 2142-2143. In particular, to avoid hindsight, the Examiner must identify a specific motivation, teaching or suggestion to combine the references. Merely finding two references in the same art field or some benefit is insufficient. Avoidance of hindsight requires a rigorous application of the requirement for a showing of a teaching or motivation to combine the prior art references (*see e.g., Ecolochem, Inc. v. Southern California Edison*, 56 USPQ2d at 1073 (Fed. Cir. 2000). “Combining prior art references without evidence of such a suggestion, teaching, or motivation simply takes the inventor’s disclosure as a blueprint for piecing together the prior art to defeat patentability—the essence of hindsight.” *In re Dembicza*k, 50 USPQ2d at 1617. Further, even where a suggestion to combine exists, it must be clear to one of ordinary skill in the art that the combination would work for its intended purpose. “Obvious to try is not the standard.” *See Ecolochem* 56 USPQ2d at 1075.

In the present case, there is no suggestion to combine the references cited by the Examiner. In particular, the references do not refer to one another and do not solve problems raised by one another. The Examiner has used Applicant’s disclosure as a blue print to combine the prior art references and then argue that it would have been obvious to combine the references. The Examiner cannot establish a prima facie case of obviousness as required. The combination of the Forbes patent and the Kouznetsov application is based on hindsight and is therefore impermissible.

Applicant respectfully submit that the claims as previously pending are patentably distinguished over the Forbes patent, the Kouznetsov application, the other cited references, or any combination thereof. Claims 1 and 20, however, have been amended without altering their scope in order to clarify the features of Applicant’s inventions. These claim amendments are not made for patentability purposes, and it is believed that the claims would satisfy the statutory requirements for patentability without the entry of such amendments.

A. Claim 1

Focusing in particular on Claim 1 and the embodiment shown in Figure 11, a floating gate transistor 205 is disclosed having a pillar of semiconductor material 300 that extends outwardly from a working surface of a substrate 305 to form a source region 310, a body region 320 and a drain region 315. The floating gate transistor 205 includes a floating gate 202 along one side of the pillar 300, wherein the floating gate overlaps the body region in a horizontal

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direction. The floating gate transistor 205 further includes a control gate 335 overlaying the floating gate 202. By placing the control gate 335 above the floating gate 202, the control gate 335 does not overlap the body region 320 in either the vertical direction or the horizontal direction.

In contrast, both the Forbes patent and the Kouznetsov application disclose floating gate transistors with control gates that overlap floating gates and body regions. Referring to Figure 3A of the Forbes patent, the Forbes patent discloses a floating gate transistor 205 with a control gate 335 adjacent to a floating gate 325, which is adjacent to a body region 320. Thus, the Forbes patent discloses a floating gate transistor with the control gate overlapping the body region in the horizontal direction.

Referring to Figure 8 of the Kouznetsov application, the Kouznetsov application discloses a floating gate transistor with a control gate 43 above a floating gate 49, which is above a body region (also known as a channel island region 19). The Kouznetsov application teaches away from the claimed invention in that the Kouznetsov application discloses a floating gate transistor with the control gate 43 overlapping the channel island (or body) region 19 in the vertical direction. The specification of the Kouznetsov application states that the “first 55 and second 56 side surfaces of the control gate 43 are aligned to third 59 and fourth 61 side surfaces of the channel island region 19, and to third 63 and the fourth 65 side surfaces of the floating gate 49, as shown in FIG.8.” Paragraph No. [0056].

The references cited by the Examiner do not disclose, teach or suggest a floating gate transistor with a floating gate overlapping a body region in a horizontal direction and a control gate overlaying the floating gate. Applicant therefore respectfully submits that Claim 1 is patentably distinguished over the cited references and Applicant respectfully requests allowance of Claim 1.

B. Claims 2-8

Claims 2-8, which depend from Claim 1, are believed to be patentable for the same reasons articulated above with respect to Claim 1, and because of the additional features recited therein. Accordingly, Applicant respectfully requests allowance of Claims 2-8.

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C. Claim 9

Claim 9 is directed to an array of floating gate transistors with a plurality of semiconductor stacks arranged in rows and in columns, wherein each stack forms source, body, and drain regions of a respective floating gate transistor. A plurality of floating gates are in trenches between the columns of semiconductor stacks, wherein the floating gates are separated from respective sides of the semiconductor stacks by a gate dielectric. A plurality of control gates overlay the respective floating gates and are separated from the respective floating gates by an integrate dielectric.

Since the floating gates are in trenches between the columns of semiconductor stacks with body regions, there is overlap between the floating gates and the body regions in a horizontal direction. The control gates overlay the floating gates and are not aligned with respect to the body regions.

The Forbes patent discloses control gates adjacent to floating gates. The Kouznetsov application discloses aligning side surfaces of control gates to side surfaces of body (or channel island) regions. Therefore, a combination of the Forbes patent and the Kouznetsov application does not suggest an array of floating gate transistors as defined in Claim 9 and Applicant believes that Claim 9 is patentable under 35 U.S.C. § 103(a) over this combination.

D. Claims 10-15 and 18-19

Claims 10-15 and 18-19, which depend from Claim 9, are believed to be patentable for the same reasons articulated above with respect to Claim 9, and because of the additional features recited therein. Accordingly, Applicant respectfully requests allowance of Claims 10-15 and 18-19.

E. Claim 20

Claim 20 is directed to a floating gate transistor that is fabricated upon a substrate. The floating gate transistor includes a first conductivity type semiconductor pillar formed upon the substrate, wherein the pillar has top and side surfaces. A first source/drain region of a second conductivity type forms in a portion of the pillar that is proximal to an interface between the pillar and the substrate. A second source/drain region of a second conductivity type forms in a

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portion of the pillar that is distal to the substrate and separated from the first source/drain region. A gate dielectric forms on at least a portion of one side surface of the pillar.

A floating gate is substantially adjacent a body region defined by the separation between the first source/drain region and the second source/drain region, wherein the floating gate is separated from the body region by the gate dielectric. An intergate dielectric forms on a top surface of the floating gate. A control gate substantially overlays the floating gate and is insulated from the floating gate by the intergate dielectric.

The Examiner states that the Forbes patent fails to disclose a control gate substantially overlaying the floating gate and insulated therefrom by the intergate dielectric, but the Kouznetsov application discloses a semiconductor device that has a control gate overlaying a floating gate separated by the intergate dielectric. However, the Kouznetsov application also teaches that the control gate is aligned with the channel island (or body) region in the vertical direction. Thus, neither the Kouznetsov application nor the combination of the Forbes patent and the Kouznetsov application teaches or suggests Applicant's claimed invention. Moreover, the combination of the Forbes patent and the Kouznetsov application is based on hindsight as there is no suggestion to combine the Forbes patent with the Kouznetsov application.

F. Claims 21-22

Claims 21-22, which depend from Claim 20, are believed to be patentable for the same reasons articulated above with respect to Claim 20, and because of the additional features recited therein. Accordingly, Applicant respectfully requests allowance of Claims 21-22.

IV. REJECTION OF CLAIMS 16-17 UNDER 35 U.S.C. § 103(a)

The Examiner rejected Claims 16-17 under 35 U.S.C. § 103(a) as being obvious over the Forbes patent in view of the Kouznetsov application and the Gamal patent. In view of the above discussion, Applicant respectfully traverses this rejection.

Claims 16-17, which depend from Claim 9, are believed to be patentable for the same reasons articulated above with respect to Claim 9, and because of the additional features recited therein. Accordingly, Applicant respectfully requests allowance of Claims 16-17.

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V. REQUEST FOR TELEPHONE INTERVIEW

Pursuant to M.P.E.P. § 713.01, in order to expedite prosecution of this application, Applicant's undersigned attorney of record hereby formally requests a telephone interview with the Examiner as soon as the Examiner has considered the effect of the arguments presented above. Applicant's attorney can be reached at (949) 721-2998 or at the number listed below.

VI. CONCLUSION

In view of the foregoing, the present application is believed to be in condition for allowance, and such allowance is respectfully requested. If further issues remain to be resolved, the Examiner is cordially invited to contact the undersigned such that any remaining issues may be promptly resolved. Also, please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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Dated: 5/5/03

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